

**IAEA**

International Atomic Energy Agency

# IAEA Support to New Research Reactor Programmes: Planning for Sustained Utilization

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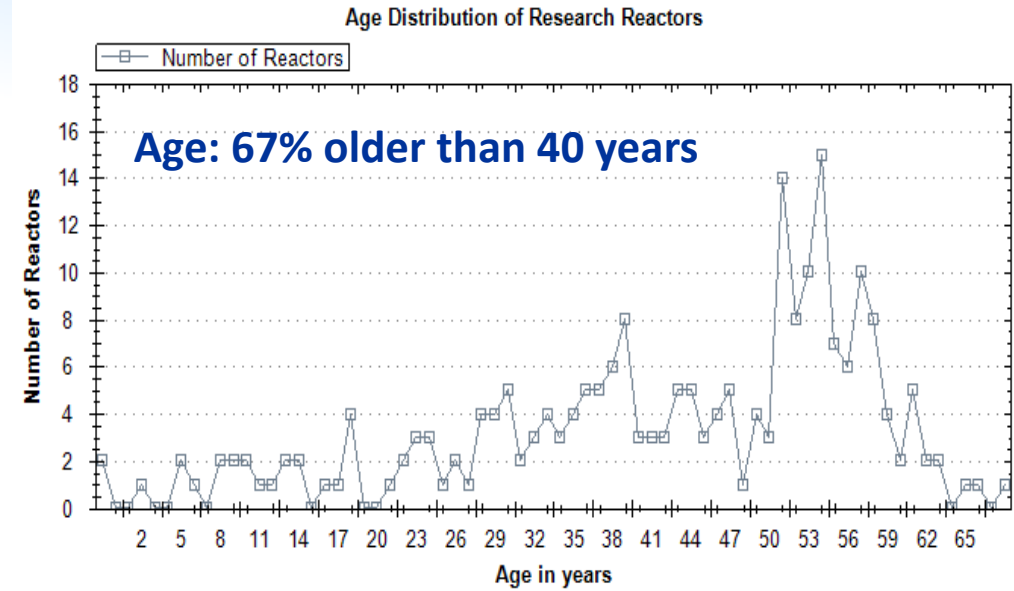
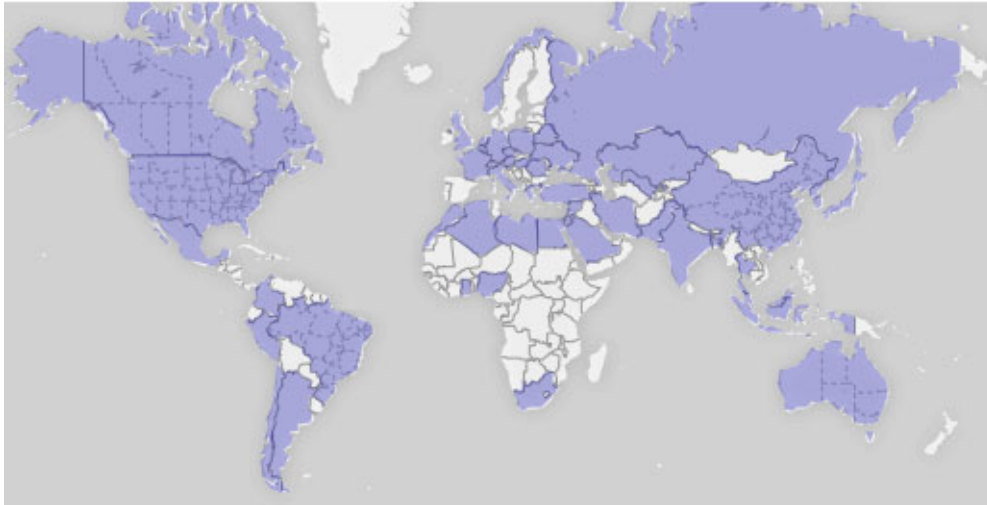
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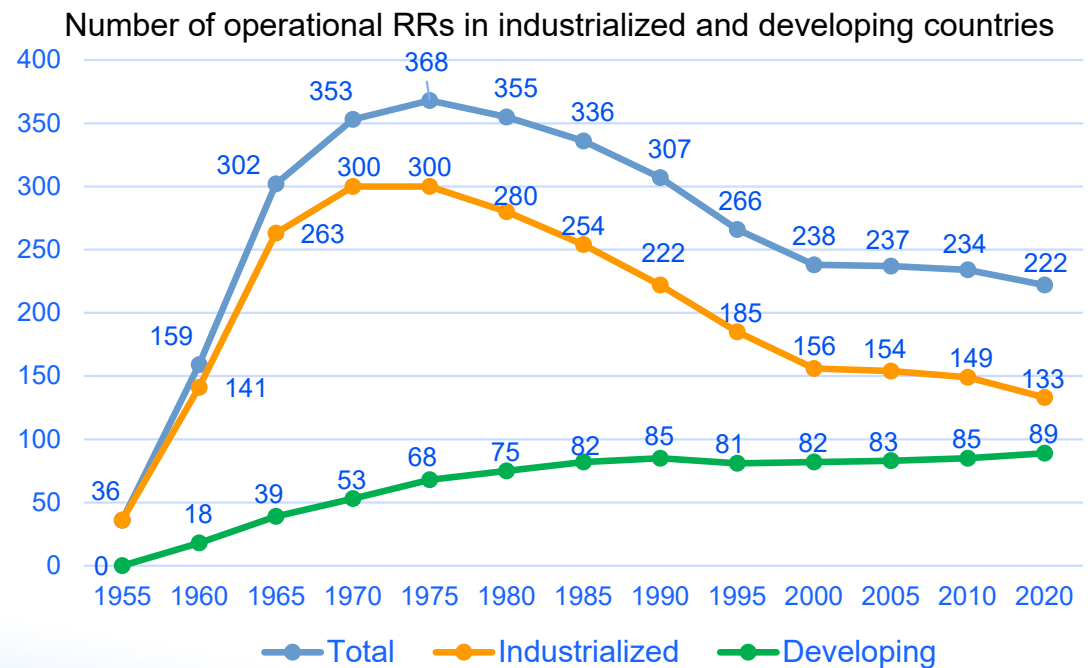
- Research reactors worldwide – Overview
- Strategic planning: new research reactor projects
- IAEA support

# RESEARCH REACTORS WORLDWIDE AN OVERVIEW

# Research Reactors Worldwide – Overview



<b>TOTAL</b>	<b>841</b>
Operational	222
Temporary shutdown	11
Extended shutdown	13
Under construction / planned	24
Permanent shutdown	58
Under decommissioning/ decommissioned	513



# Research Reactors Worldwide – Overview

## New research reactor projects

**11** new research reactors (RRs) are under construction in **8** countries



## formal plans to construct new RRs



## considering building RRs



Over 30 IAEA Member States developing or planning new research reactors

More than 10 IAEA Member States working on their first ever research reactor project

From 2021 Nuclear Technology Review.

In addition:

“under construction”:

Thailand

“considering”:

Colombia

Nigeria

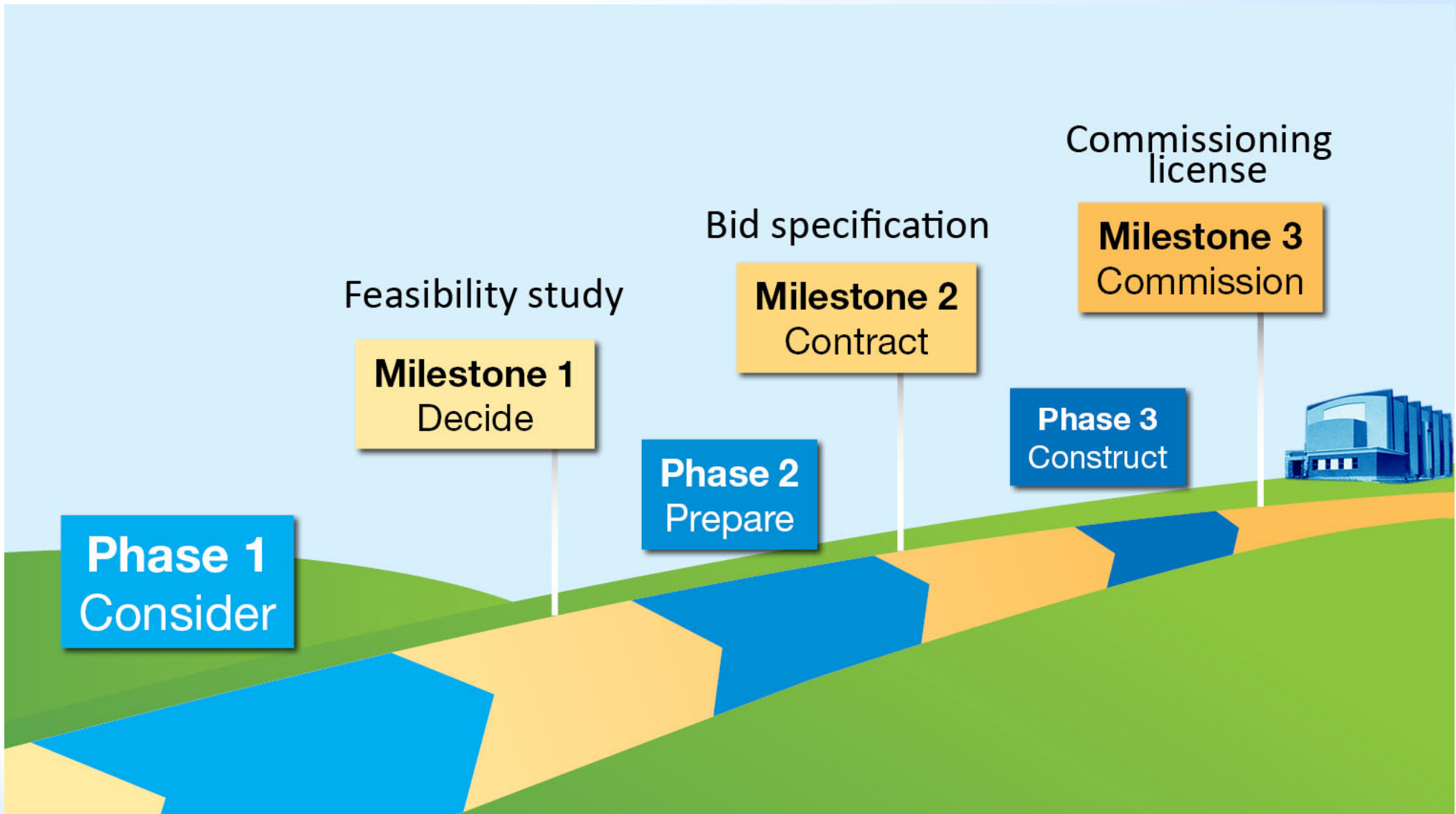
Rwanda

Uganda

United Kingdom

# **STRATEGIC PLANNING FOR A NEW RESEARCH REACTOR PROJECT**

# The Milestones approach



...and after operational phase, decommissioning

# Pre-project (Phase 1): Justification

- A new research reactor project should start with a **justification** based on the **national and/or regional needs** for research reactor services, the evaluation of available alternatives, and the availability of **sufficient financial, technical and human resources to implement the project**
- Experience shows that some countries **have not developed a sound justification** for their RR resulting in a facility which is not well utilized
- During the Phase 1, the country completes the **Preliminary Strategic Plan** and determines whether there are scientific, industrial or medical **needs that justify the construction of a research reactor**
- This step highlights the important policy issues, and **determines size, type, power level, and cost** of the RR and its ancillary facilities



# Pre-project (Phase 1): Justification

- Make sure that **type, size, power and cost of the RR and ancillary facilities match the needs of the potential stakeholders and financial resources**
- The **ancillary facilities are considered as an integral and essential part of the RR project** as their quality and adequacy determine a large part of the **usefulness and effectiveness of the RR**
- Once justified, **ensure on-going resource commitments** (including for operation and maintenance) to long term safety, security, availability and reliability, including its decommissioning
- **Ensure high and sustained RR utilization throughout the RR's operating life**

# Preliminary Strategic Plan

- Used to **gather support from the potential stakeholders (SHs), suppliers and international partners**, as well as **provide clear guidance to national decision makers** on the actions expected of them for a safe and successful RR project
- **Updated and enhanced regularly** during the different project phases
- Should include the **RR and its ancillary facilities, research centre if appropriate**
- **Summarizes the justification for the RR and ancillary facilities**, and develop recommendations for the financial and organizational structure of the RR, associated research centre and ancillary facilities, as well as policy decisions and actions required from the government
- The Preliminary SP clearly sets out the RR purpose, utilization, SHs, expected performance indicators, and should include a SWOT analysis.

# Preliminary Strategic Plan

The Preliminary Strategic Plan is a demonstration that:

- The range of potential utilization of the research reactor has been studied and documented;
- The potential major stakeholders for the research reactor have been identified and consulted;
- The options for regional and international cooperation have been properly considered;
- Mechanisms are identified to encourage input from all stakeholder communities on potential areas of research reactor utilization;
- Mechanisms to adapt the reactor mission to evolving stakeholder needs have been addressed;
- Funding and other resource requirements are identified.

# Approach for SP development

Outcome

Support system for implementation of activities

Sound basis: SH engagement ensures availability of resources

Utilization and Sustainability

Stakeholders of  
Irradiation Services

Stakeholders of  
Research

Stakeholders of  
Education and Training

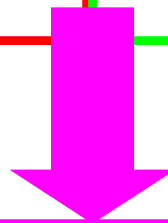
Stakeholder Engagement

Facility – Finances – Staff

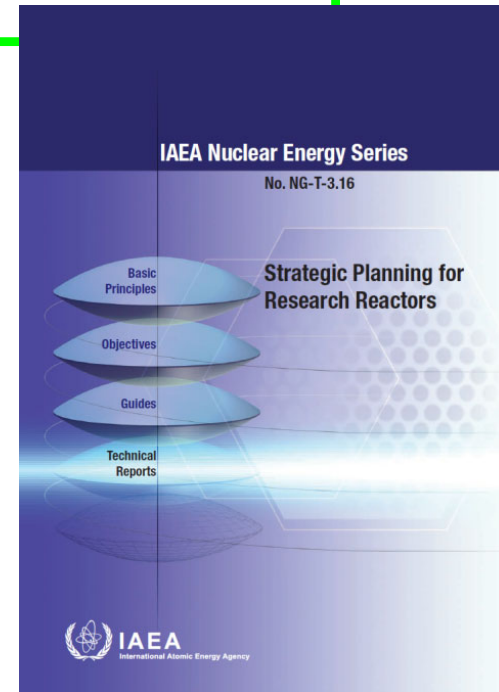
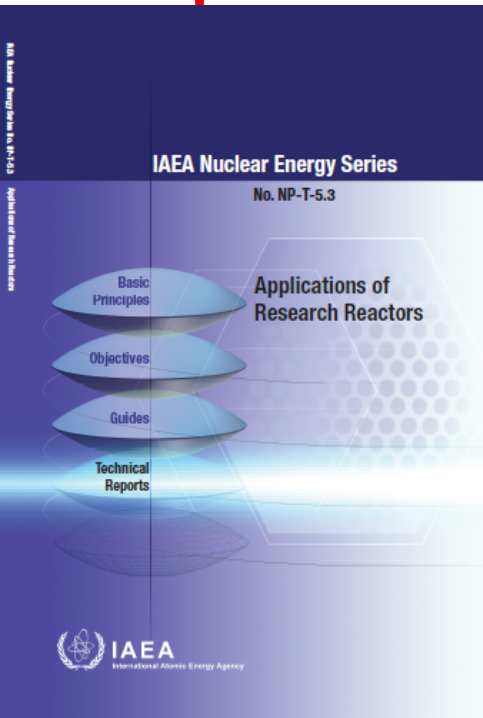
# Approach for SP development

Facility Proposed  
Capabilities  
What could I do?

Stakeholder  
Requirements/Needs  
What should I do?



Production of a preliminary SP  
supports Milestone 1: Make a  
knowledgeable commitment to a RR  
project



# Developing a SP for new RR projects

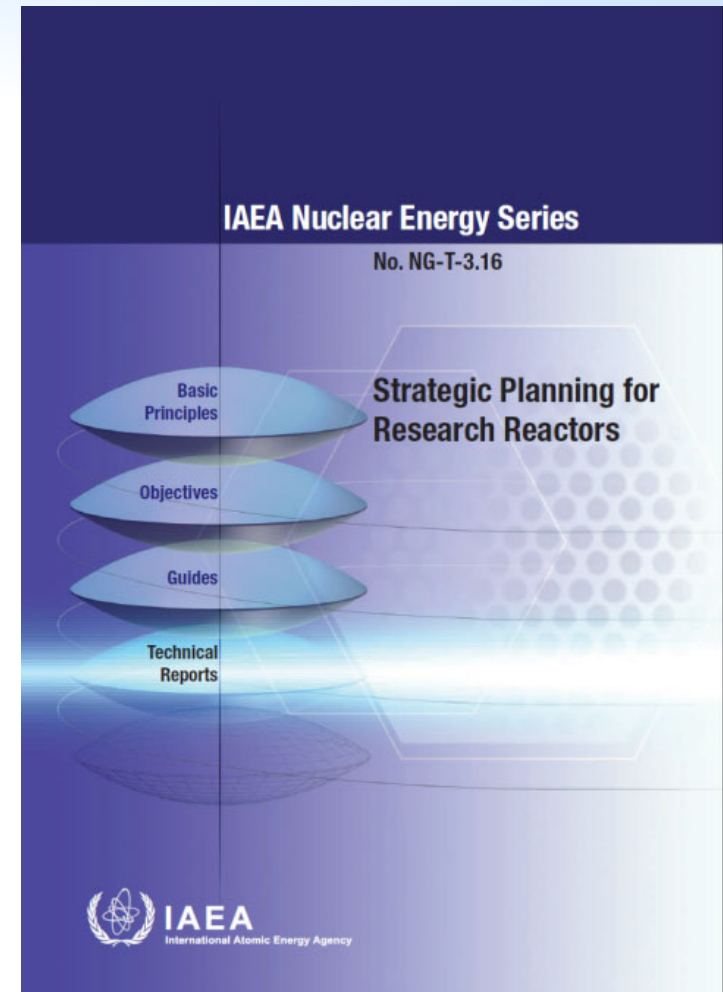
- a) Determine who are the potential stakeholders (SH) and what are their needs in the utilization of the facility
- b) Determine the required capabilities of the new facility based on those needs
- c) Perform an iterative analysis based on a) and b) in the context of the environment and constraints under which the facility will operate, in order to:
  - i. Generate a **vision of future goals and major objectives** (MOs)
  - ii. Decide on a few **specific objectives** (SOs) and the detailed **action plans** required to achieve them
  - iii. **Implement, review progress and revise the plan**

**This analysis assists in the development of the functional specifications**

# IAEA SUPPORT

# Strategic Planning for RRs - Guidance

- IAEA Nuclear Energy Series NG-T-3.16 (2017) is the guide on strategic planning of RRs
- Improved approach to assist both existing and new RR projects
- **Provides guidance on how to develop and implement a SP for a new RR project**
- **Of particular interest to operating organizations that are preparing a feasibility study to establish a new facility**
- Complements NP-T-5.1 “Specific Considerations and Milestones for a Research Reactor Project” and NG-T-3.18 “Feasibility Study Preparation for New Research Reactor Programmes”
- E-learning course at IAEA’s CLP4NET e-learning platform:  
<https://elearning.iaea.org/m2/course/view.php?id=570>





# Training Workshops

- **On Strategic Planning for RRs (2014, 2016, 2018, 2021)**
  - Participants are asked to submit a new or revised SP document in advance
  - Individual recommendations provided to all
  - Examples of good SP documents available
  - Lessons learned and good practices from other regions shared
- Workshops implemented by Research Reactor Section-NE with contribution from Research Reactor Safety Section-NS and Physics Section-NA, where planning for utilization as an important role:
  - TW on the Preparation of a Feasibility Study for a New Research Reactor Project
  - TW on on the Assessment of the National Nuclear Infrastructure to Support a New Research Reactor Project
  - TW on Technical Requirements in the Bidding Process for a New Research Reactor



# On-demand review of strategic plans



- On request, the IAEA reviews and provides feedback on strategic plans of RR facilities.
- This service is available on demand by Member States at any time
- Over 50 strategic plans have been reviewed in the last 5 years, many of them for planned RRs

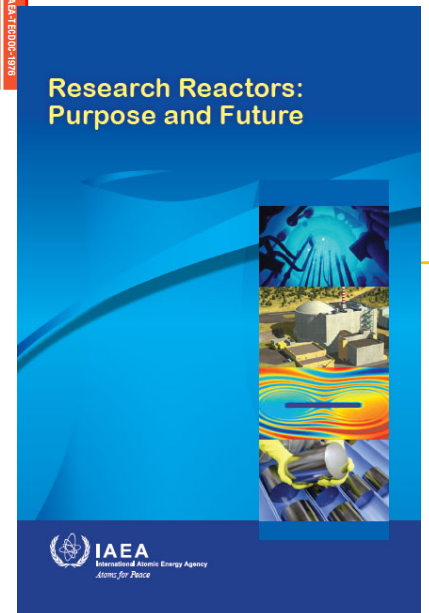
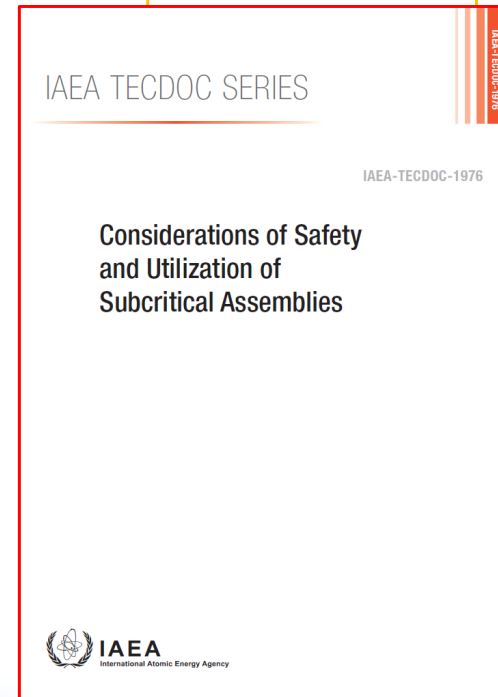
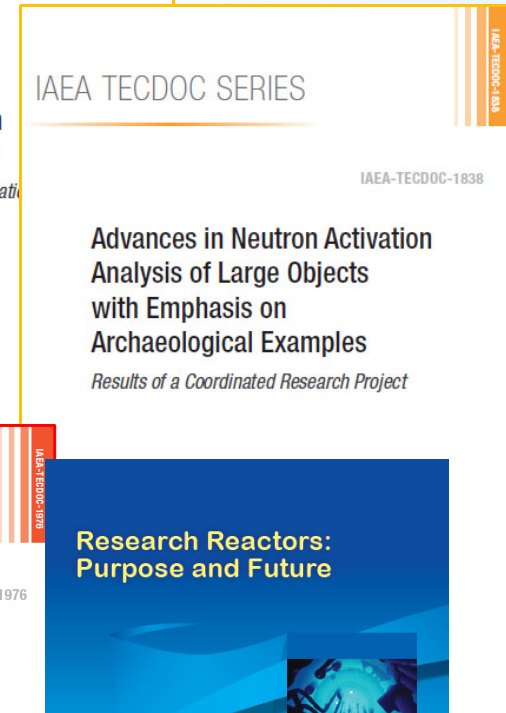
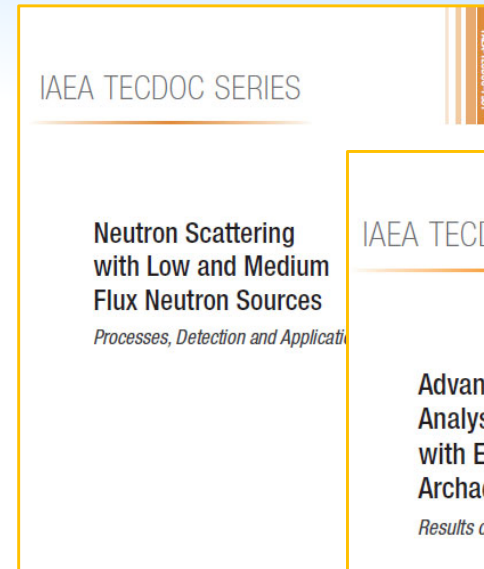
# Technical cooperation

These activities are usually supported by a national (or regional) technical cooperation project

- National Users' Workshops
- National Workshops on Milestones Approach for New Research Reactor Programmes (NE/NS/NA)
- Capacity building for the new RR project team: fellowships, scientific visits, support to participation in workshops, meetings, conferences, etc, relevant to utilization and strategic planning
- Expert Missions on specific aspects of utilization and utilization planning can be undertaken

# Publications

- Guidance publications
- Publications on specific applications

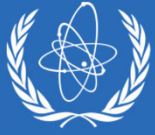


# Integrated RR Utilization Review (IRRUR)



- Peer review service available to Member States on request since December 2019
- For operations RRs or in temporary or extended shutdown
- Assessment of the current utilization level of research reactors, and opportunities towards increased and sustainable utilization , considering existing and potential capabilities, constraints, and needs for the products and services that the research reactor can provide.
- Directed to all the major activities of the research reactor or limited to specific facility mission areas.
- Pilot IRRUR mission to LENA in Italy, April 2019
- IRRUR missions to RECH-1 in Chile, July 2022, and RP-10 in Peru, August 2022
- Four further requests already received, of which two to be conducted in 2022
- Funded by a technical cooperation project or by the facility





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*Thank you!*